10.2 STRATOSPHERIC TEMPERATURE - OZONE RELATIONSHIPS 1978 - 1986

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Global stratospheric temperature and geopotential height at eight pressure levels (70, 50, 30, 10, 5, 2, 1, and 0.4 hPa) have been derived at NMC daily since October 1978. These fields are based on NOAA operational satellite sounder information. Comparable daily global fields of stratospheric ozone (30 to 0.4 hPa and total ozone) have been derived from the SBUV instrument on Nimbus 7 and are now derived from the operational NOAA SBUV/2 instrument. The ozone and meteorological fields are verified against ground-based measurements (Umkehr, balloon, rocket, lidar) to determine fields of temperature and ozone has been assembled. We will discuss some of the interesting features of correlation between the synoptic patterns of the two data sets as well as their change with time. Seasonal as well as interannual variations in the patterns of correlation will be compared in the Northern and Southern Hemisphere polar regions. Other outstanding features in both the temperature and ozone fields will be highlighted.

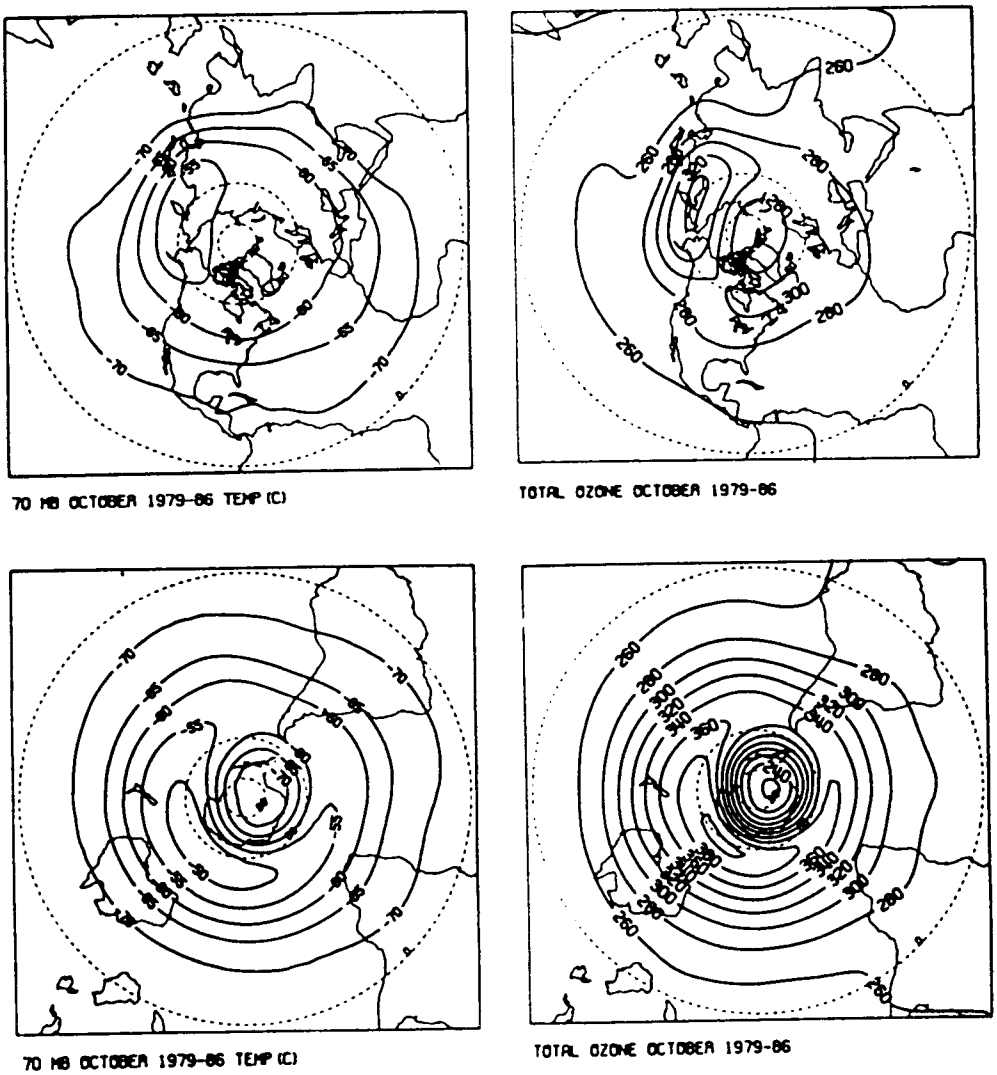
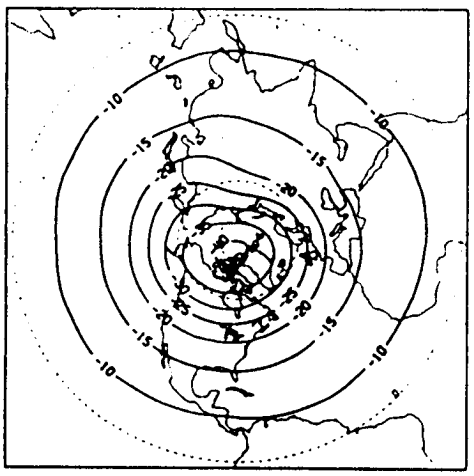
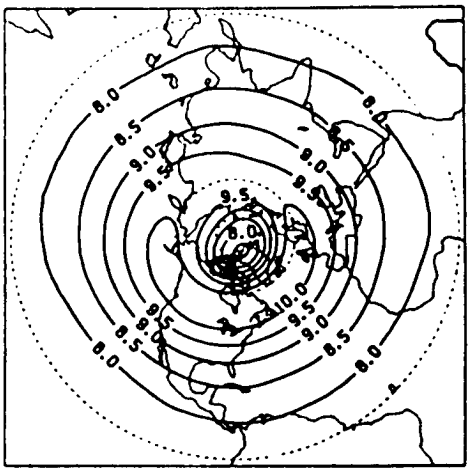


Figure 1(a).

Figure 1. (a) and (b) show the 1978-86 mean October 70 hPa and 2 hPa temperature and ozone maps for the Northern and Southern Hemispheres [Nagatani et al., NOAA Tech. Rep. NWS 40, 1988]. At 70 hPa, the warmest air over each polar region is shown in the area of highest ozone, and the lowest temperatures are seen over the longitudinal region with lowest ozone. However, at 2 hPa the reverse is seen in both polar regions, with low temperatures generally associated with high polar ozone, and high temperatures in the area of lowest ozone. These features are well known and are generally explained as showing that the distribution of ozone in the lower stratosphere is dynamically driven, whereas in the upper stratosphere photochemical processes dominate.


2 MB OCTOBER 1979-86 TEMP (C)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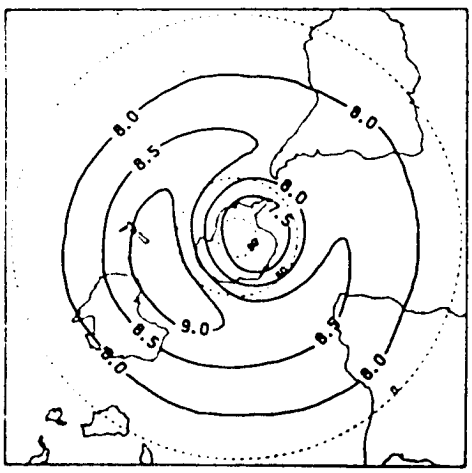
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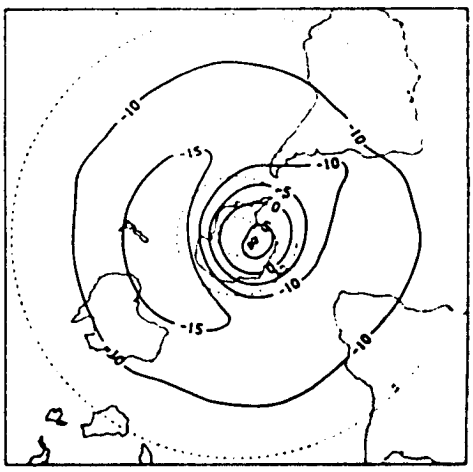
2 MB OCTOBER 1979-86 TEMP (C)

Figure 1(b).

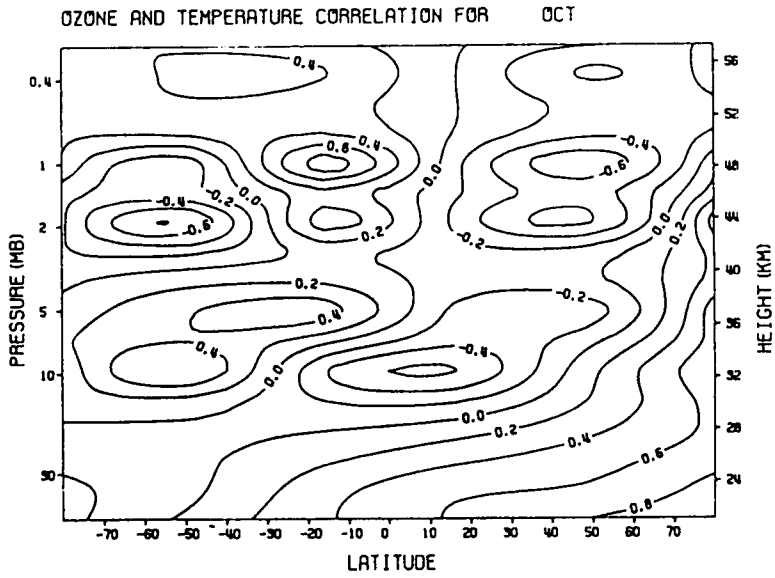

Figure 2. Shown are the correlations of ozone and temperature for October, January, and July for 30 to 0.4 hPa for all latitudes. The patterns of correlation for the north and south polar regions in October are similar because this is a winter month in each hemisphere for the stratosphere. There is positive correlations at lower levels and strong negative correlations at upper levels. For January and July, each winter hemisphere polar region again shows a similar correlation pattern to that of October. However, the polar latitudes in the July summer Northern Hemisphere show negative correlations at lower levels and positive correlations at upper levels. This is different from the January summer Southern Hemisphere which shows positive correlations at lower levels and negative correlations at higher stratospheric levels, similar to the pattern in the winter hemisphere. The summertime circulation is dominated by zonal flow, so that correlations may represent only small eccentricity from this pattern.

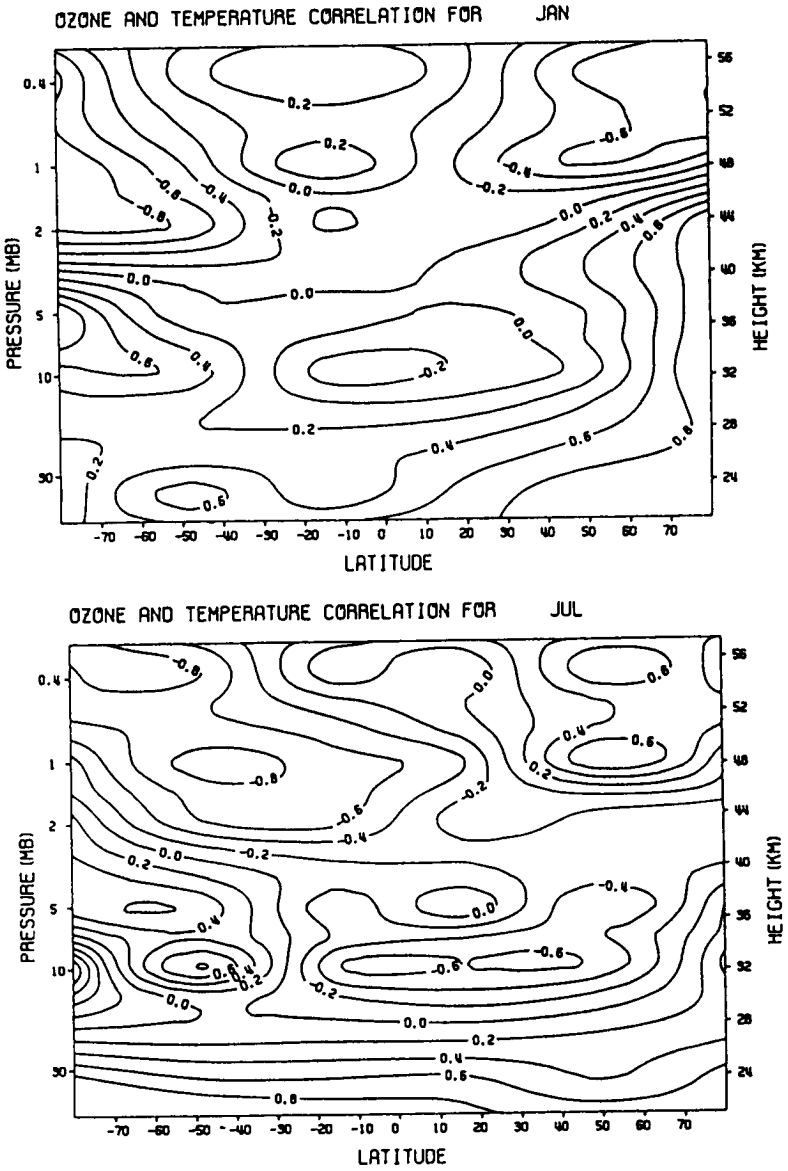

Figure 2 Continued.

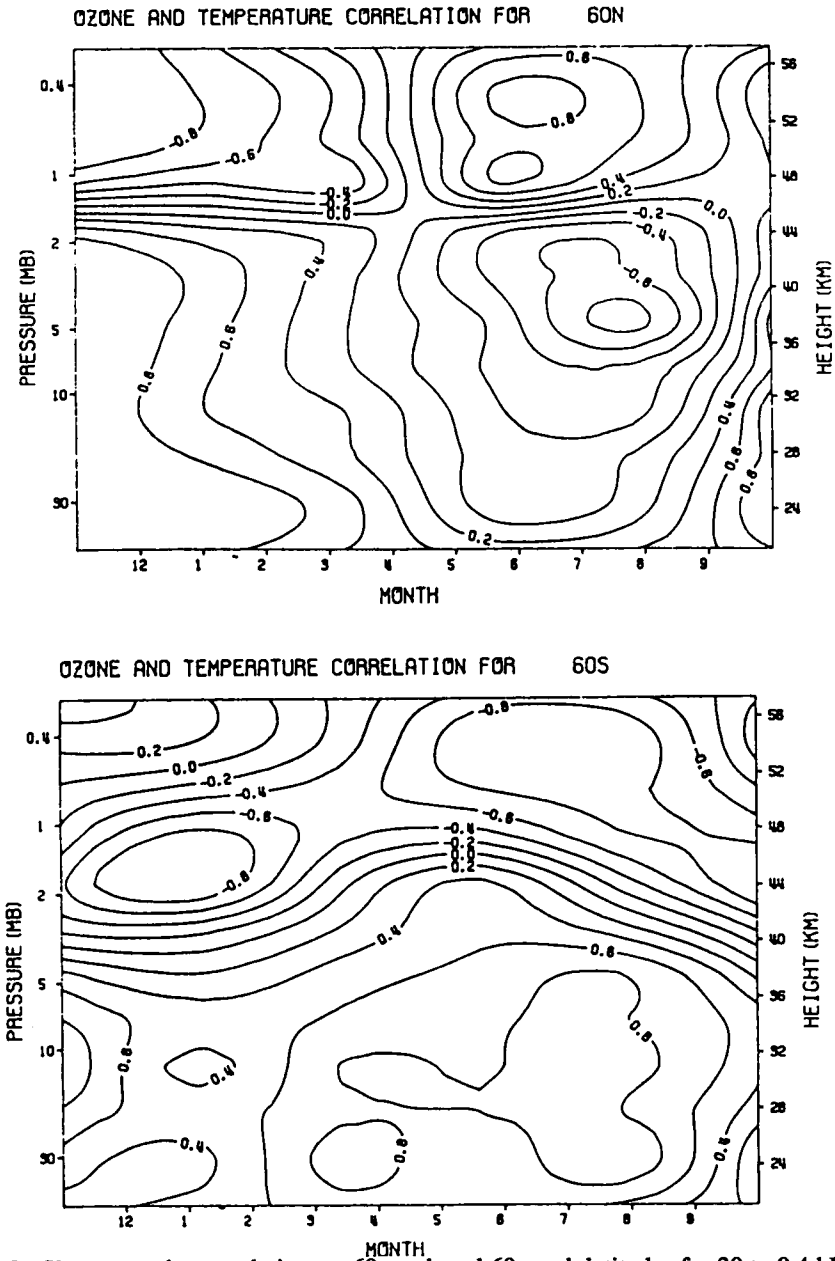

Figure 3. Shown are the correlations at 60 north and 60 south latitudes for 30 to 0.4 hPa and for each of the 12 months. Again, the patterns of correlation shown are similar for the north and south polar regions for the respective winter months, with strong positive correlations of greater than 0.8 at lower levels and strong negative correlations at upper levels. This sense of correlations agrees with the synoptic picture shown in Figures 1 and 2 and with our discussion of those figures.